

U. S. DEPARTMENT OF AGRICULTURE.

FARMERS' BULLETIN 483.

THE THORNLESS PRICKLY PEARS.

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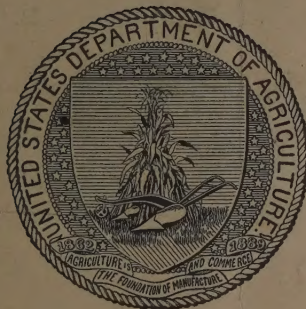
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LETTER OF TRANSMITTAL.

U. S. DEPARTMENT OF AGRICULTURE,
BUREAU OF PLANT INDUSTRY,
OFFICE OF THE CHIEF,
Washington, D. C., December 28, 1911.

SIR: I have the honor to transmit herewith and to recommend for publication as a Farmers' Bulletin a manuscript entitled "The Thornless Prickly Pears," by Dr. David Griffiths, which has been submitted for publication by Prof. W. J. Spillman, Agriculturist in Charge of Farm-Management Investigations.

Respectfully,

B. T. GALLOWAY,
Chief of Bureau.

HON. JAMES WILSON,
Secretary of Agriculture.

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THE THORNLESS PRICKLY PEARS.

INTRODUCTION.

The terms "thornless" and "spineless" prickly pears as used in this paper are intended to designate those large rapid-growing species of the botanical genus *Opuntia* which do not produce so many spines and spicules that they can not safely be fed to live stock. (Figs. 1 and 2.) No account is taken here of numerous small spineless



FIG. 1.—A very rapid-growing species of prickly pear with few spines, from Mexico.

forms,¹ some of which will withstand a great deal of cold. They are of such slow growth and are so small at best as to be of no economic value. Even some species² which are spineless and attain a good growth are not considered. They, as well as the smaller ones of the first-mentioned group, are excluded because they are armed with

¹ *Opuntia vulgaris*, *O. macrorhiza*, and *O. allairei*.

² *Opuntia subarmata*, forms of *O. coccinifera* and *O. ellisii*.

many spicules and have not as yet given satisfactory results when used as forage. The second group is practically without spicules but of slow growth.

It must be remembered that the words "thornless" and "spineless" are only relative terms. There is no species of the prickly pear entirely without an annoying needle-like armature. The different species of the genus *Opuntia* have two forms of spines designated in descriptive works as "spines" and "spicules." The plants discussed here are nearly free from spines. They bear spicules, which



FIG. 2.—One of the best spineless species of prickly pear, a rapid grower and bearing edible fruit, from the Mediterranean region of Europe.

are simply small, fragile, and easily detached spines, in varying number, but not enough to prohibit their being fed to cattle without previous preparation.

GEOGRAPHIC DISTRIBUTION OF THORNLESS PRICKLY PEARS.

At the present time there are spineless forms of prickly pear scattered over most of the warmer regions of the globe. To regions which have truly moist, tropical climates, such species as the cochineal cactus (*Nopalea cochinelifera*) appear to be the best adapted. To the warm temperate regions and to the regions of periodical rainfall various species of the genus *Opuntia* are better suited. Spineless

forms are most abundant in the mediterranean regions of the three continents. They are common but never extensively cultivated in Mexico. Frequently they are met with in the tropical and sub-tropical islands, while similar forms are found in South Africa, Australia, and South America. In the United States an occasional plant is found along the Florida coast. In California they are more or less common in parks, where they were introduced many years ago. Recently they have been distributed by the Department of Agriculture on the immediate coast of the Gulf of Mexico and in southwestern Arizona and southern and western California.

In 1909 the Department of Agriculture published a preliminary map¹ indicating, in a general way, the regions best adapted to the culture of these plants. Subsequent experience has proved that the area shown in that publication was rather too large.

Prickly pears may be grown along the coast of California as far north as Humboldt County, and some of the *Opuntia robusta* group, which although large are rather slow growers, may be extended into Del Norte County. In the interior valleys the limit of their endurance appears to be reached in Butte County. At Chico, Cal., they are injured about every third or fourth year and occasionally look as though nearly killed by low temperatures; by leaving the plants alone, however, they have recovered with practically no loss. In the past they have suffered to a somewhat greater degree in portions of the San Joaquin Valley. This applies to the large, rapid-growing, Indian fig group. The cochineal pear is much less hardy and will not live at Chico without protection.

In southern Texas the area where thornless prickly pears may be grown, outlined in the map referred to, must be greatly restricted. There is very good evidence that the plants will not thrive permanently north of the Texas Mexican Railway. During the winter of 1910-11 they were cut to the ground at Falfurrias, and some were injured slightly as far south as the northern part of Cameron County. Experimental cultivation near Corpus Christi indicates that even on the immediate coast their success is questioned. It is evident that prickly pears will not succeed along the Gulf coast of the Southern States except in Florida. It has been demonstrated that in the interior of that State they will not succeed, even though the temperatures are favorable, but recent reports indicate that they may do well in restricted portions of the coastal region.

In Arizona the plants may be grown with irrigation from the Colorado River eastward as far as Tucson upon the valley and desert mesa lands.

¹ Bulletin 140, Bureau of Plant Industry, U. S. Department of Agriculture, entitled "The 'Spineless' Prickly Pears," p. 15.

It will be seen that the culture of spineless prickly pears in the United States is limited to the coast and interior valleys of California, the extreme southern portion of the Rio Grande Valley in Texas, the warmer portions of southern Arizona, and possibly the coastal region of southern Florida. Their growth upon the elevated regions of California and Arizona is soon limited by the increasingly low temperatures, and they will not endure the winter temperatures of any locality in New Mexico.

MOISTURE REQUIREMENTS.

It is as difficult to place the limit of drought endurance for the thornless prickly pears as for any other cultivated crop. The prevalent notion that these plants need no water is erroneous and should be given no credence whatever. Neither are the plants as resistant to drought as many of the spiny natives.

The desert mesas of Arizona, with their rainfall of 6 to 11 inches, are altogether too dry for the growth of these plants, even with the best of cultivation. In the upper foothills of the Santa Rita Mountains, at an elevation of about 4,000 feet, where the rainfall is 15 to 18 inches, the plants will thrive when protected from the inroads of rodents, but they make only a moderate growth. With good cultivation, at Chico, Cal., the winter moisture is prolonged sufficiently into the dry summer to enable the plants to grow vigorously from April to October with no additional water. It is to be remembered that these plants are surface feeders and do not draw vigorously upon the lower layers of subsoil for their moisture. In southern Texas they never appear to suffer from drought under even moderate cultural conditions, although no rain may fall for four or five hot months.

The question is often asked whether one can afford to grow spineless prickly pears if he has to irrigate them. This question can be answered only by the grower, as it depends upon the use to be made of the crop. It can be grown upon possibly one-third of the water required to grow alfalfa in most situations, and for this reason, if for no other, it may be profitable. On the other hand, if one needs succulent feed at a time when other crops are dry and he can grow prickly pears for that purpose, they can be made decidedly profitable.

TEMPERATURE REQUIREMENTS.

Like all other perennials it is impossible to state definitely what degree of temperature the plants of thornless prickly pears will stand or at what temperature they will be killed. So much depends upon surrounding conditions and circumstances that to predict within five degrees the temperature which they will endure under all circum-

stances is scarcely possible. The condition of the plants at the time of a freeze and the duration of the cold weather are most important considerations. In a region like southern Texas, where good growing weather may be followed within a few hours by a temperature of 20° F., more injury will be done than by the same freeze when the plants are dormant. Much also depends upon the conditions of the weather following the freeze. The blanket of fog that commonly obtains in the interior valleys of California during and following a cold season counteracts the effect of temporary low temperature to a remarkable degree.

Under average conditions a temperature of 20° F., if continued for any length of time, may be taken as fatal to these plants. They have been injured a little by this temperature in extreme southern Texas. They have suffered at the same temperature in the Sacramento Valley of California, but have recovered with little loss. At that time minimum temperatures of 22°, 21°, and 20° F. were experienced upon three successive nights, and freezing weather continued during the greater part of the three-day period. Under these conditions the plants were thought for a time to be practically dead to the ground, but after the advent of warm growing weather they recovered almost entirely. There was a loss of only about 1 per cent of the stock. If they had been handled, however, before the warm growing weather set in there would have been a heavy loss. Roughly speaking, it is believed that a minimum of 20° F. marks the limit of the endurance of these plants.

YIELDS.

No one in this country, so far as known, has much accurate information regarding the yields which the thornless prickly pears will make. They have not been planted extensively enough nor for a long enough time so that anyone is justified in making a general statement concerning this point. At Chico, Cal., where the stock of the Department of Agriculture is grown, no accurate measurements have been made. It can only be stated in a general way that the yield is satisfactory and that it is somewhere between 20 and 25 tons to the acre per annum. This, it must be remembered, is with expert cultivation and the maintenance of a perfect stand. The plantation has been carefully cultivated. All weeds have been kept down during the growing season and a good tilth maintained during the summer. Once or twice each year the whole plantation has been gone over and missing plants replaced.

A yield of 20 to 25 tons to the acre pays well, especially when other characteristics of the crop are taken into consideration. Such a yield means sufficient roughage for one cow from one acre without irrigation.

COMPOSITION AND VALUE OF THE FORAGE.

At various times attempts have been made to prepare commercial foodstuffs and silage from the prickly pear. It is a natural silage in that it can be gathered in the green, succulent stage at any time of the year. It is not, however, well adapted to drying. It parts with its water with extreme difficulty and contains such a large quantity that it is questionable whether an attempt to make it into dry fodder would be profitable. Again, even when the difficulty of drying is disregarded there is a still more potent objection in the fact that the dried product is not so palatable to stock, probably on account of the large quantity of mineral matters present, as demonstrated by the large quantity of ash residue when the plant is burned.

Viewed from any angle it would appear that the spineless prickly pear can be most advantageously and economically fed in the green, fresh state. In this condition the feed is to be compared most closely with root crops and immature, green corn fodder, and it should be fed in much the same manner. Being bulky and containing so much water, the feed will never be transported far, but will be grown close by, so that either the cattle can be turned on to it to graze or the haul to the feeding lot will be short. Its high water content, together with the accompanying high average salt content, makes it a laxative feed when eaten in large quantity.

In this country no feeding tests with spineless prickly pears of long enough duration and varied enough in character to warrant any definite conclusions have been conducted, although extensive investigations of the spiny natives of southern Texas have been made. It is probably safe to substitute results obtained by practical feeders and scientific investigators with the spiny prickly pears for the spineless ones and to make calculations accordingly.

Although practical dairymen have used the native prickly pear successfully for months at a time, with almost no other roughage, it is more than probable that the best results could be secured by using some dry roughage in connection with it—feeding the prickly pear in a manner comparable to silage as commonly employed, i. e., as a part of the roughage in a dairy ration. This conclusion is reached upon both chemical grounds and the experience of some of the best posted feeders. On the other hand, some of the best herds in southern Texas have thrived on a continuous roughage ration of prickly pears and have kept in the best of condition with a rather heavy concentrated ration of cottonseed meal and rice bran. In one instance a herd of 80 to 100 cows had no other roughage for nearly two years. No inconvenience was apparent and the milk flow was good. Although the feed has a tendency to scour, it was considered by the dairymen that no injury resulted from this cause.

Many chemical analyses of the spineless prickly pears have been made, but nearly all lack very essential data. Usually it is impossible to tell exactly what forms were analyzed and there is seldom any idea given as to the portion of the plant used in the analysis. It is more than probable that it will be found, as in the spiny species, that old, woody stumps of three or more years' growth are preferred in feeding to the youngest, more succulent joints. Field experience indicates that cattle prefer the more mature joints. Prof. R. F. Hare, who has done more work on the chemistry of cacti than anyone else, has analyzed ¹ a form with few spines which is closely related to this spineless group, and his results can be accepted until more work is done. Two analyses were made from cultivated plants grown at Laredo, Tex. Sample No. 7577 contained one joint each of 1, 2, and 3 year old growth. Sample 7519 contained one joint each of 2, 4, and 5 year old growths.

TABLE I.—*Chemical composition of two samples of a practically thornless form of prickly pear grown at Laredo, Tex.*

Constituent.	Green.		Air dry.	
	7519.	7577.	7519.	7577.
Water.....	81.16	92.25	5.18	8.12
Ash.....	4.29	1.75	21.65	20.80
Crude protein.....	1.32	.63	6.68	7.53
Crude fat.....	.28	.16	1.40	1.85
Nitrogen—free extract.....	8.88	4.02	44.56	47.60
Crude fiber.....	4.07	1.19	20.53	14.10

There have been few direct comparisons made between this and other feeds. One conducted at San Antonio, Tex., some years ago indicated that 6 tons of green, succulent prickly pear of a native spiny form is equal to 1 ton of good sorghum hay.

The value of the spiny native is very similar to that of the spineless prickly pear, and in the absence of direct tests we are justified in substituting these results when considering thornless varieties. There is probably little difference in the chemical composition of the two types, and the analyses given will indicate as much concerning the actual feeding value of the spineless varieties as they do with respect to the species analyzed. Indeed, in the cultivation of the prickly pear the most important point to be considered is rapidity of growth. The composition of the rapid-growing varieties is so similar that it will not be profitable at present seriously to consider it.

SOIL ADAPTATIONS AND REQUIREMENTS.

The mistake should not be made of expecting that the spineless prickly pear will grow anywhere and on any kind of soil. If well cared for and if it receives a suitable supply of water and good

¹ Bulletin 60, New Mexico College of Agriculture and Mechanic Arts, 1906, p. 73.

drainage it will thrive on almost any soil if the temperatures do not go too low. However, the plants make the best growth on the best soils, like any other crop. This is particularly noticeable in any native prickly-pear country; the best crop is on the best soils. This fact has been noted very emphatically by Prof. Maiden in his discussions of the regions of Australia infested with prickly pears.

IDEAL CONDITIONS FOR GROWTH.

If the temperature never fell below 25° F. southern Texas would be an ideal region for the spineless prickly pears, and the cultivation of this crop would be exceedingly profitable. For its best development there is required good soil, irregular, comparatively heavy rainfalls, and a high minimum temperature.

It will be readily seen that there are indeed few regions upon the mainland of the United States where conditions are ideal for the cultivation of the spineless prickly pear. The temperature falls too low over the greater part of southern Texas, and in California the rainfall comes in the winter season when the plants are dormant. In the latter situation, however, the effect of the dry summer season can be overcome in many sections by thorough cultivation, rendering it possible to grow good crops without irrigation. In the drier portions of the Southwest, from about Tucson to the southern Sierras, the crop must be irrigated. Throughout California, in the higher regions where the temperature goes below 20° F., the location must be looked upon as dangerous for the culture of these plants. It must be remembered that colder temperatures can be endured by most plants in many situations in California than in southern Texas. This is due to the lack of dormancy in the plants in the latter situation, as well as a sudden and marked rise in temperature after a hard freeze.

Ideal conditions for spineless as well as spiny prickly pears are found on the high lands of Mexico where there are two rainy seasons, one in winter and the other, more pronounced, in summer. Over much of the region a minimum temperature of 25° F. is seldom experienced.

PROPAGATION.

It is seldom that the farmer who grows these plants will resort to anything but vegetative propagation. He will grow all of his plants from cuttings. A cutting will usually consist of a single joint, although larger ones can be used profitably if time, convenience, and economy of stock are no object. Mature plants can be grown much more quickly from cuttings consisting of three or four joints, but if one is establishing a plantation of any magnitude such cuttings are impracticable for several reasons. Often large plants, weighing 200

pounds or more, need only to be cut off and put into the ground. Under favorable conditions they will develop root systems and scarcely reveal the influence of the shock, provided they are not bruised in handling.

The plants can also be readily grown from seeds. This applies especially to the large, economic, rapid-growing spineless species. While experience with seed propagation is rather limited in this country, it can be stated as a general principle that the plants come true from seed and that there is little, if any, greater variation in seedlings than in vegetatively grown plants. Propagation from seeds, however, is slow and not to be seriously considered except



FIG. 3.—Propagating plats of prickly pears at the Plant-Introduction Garden, Chico, Cal., immediately after the crop was harvested for distribution in April, 1911.

in special cases where cuttings are difficult to obtain on account of long delays in transportation or when they must be transported for a great distance. In securing good mature plants from seed and from one-joint cuttings the time consumed will be approximately as 5 to 3.

Seeds should be planted in a seed bed with a light soil, and their treatment does not differ materially from that of other common plants grown in the same way. The beds should be well drained and kept uniformly and moderately moist. When the young plants are 2 inches high they can profitably be transferred to the nursery row or to pots, where they can remain until they are 1 or even 2 years of age. When transplanted to the field the seedlings may be planted entire and set deep or be cut up into two cuttings each. On account

of the tendency in the seedling to be rather slender it will often be better to divide the young plant into cuttings in order to gain greater stability at maturity. In practice, single-joint cuttings 1 to 3 years old will be used. The stock planted should be well matured, 1 year old or more. Younger growths will develop very well if conditions are favorable and in time make as good plants as the older cuttings, but they are not as certain and do not start off as vigorously as the latter. In propagating from a small amount of stock there will be no advantage in making cuttings more often than once each season, and then at the beginning of the growing period. There is almost no limit to the age of wood that will grow. Trunks which have largely lost their joint characters and become 8 to 10 years old will grow when cut up into suitable lengths and planted.

In the preparation of cuttings the stem should be divided as close to the articulation between the joints as possible, and the cut should be made below rather than above the articulation (fig. 3). This is not a particular matter, but the closer the incision is made to the constriction between the joints the less surface there will be to heal over.

PLANTING.

No plants are more easily handled than thornless prickly pears. They are usually grown from cuttings, which start readily. They must be in firm contact with the soil, but if the soil is moist the cuttings will usually grow, even though they are not inserted into the ground, provided, of course, the weather is not too hot, in which case scalding of the joints occurs, resulting in their destruction.

When one has but a few cuttings it is better to set them by hand, as any other tree. When a large planting is to be made, however, it is better to open up a deep furrow and distribute the cuttings at proper distances on the furrow slice. Another furrow turned in the same direction will accomplish the covering. Subsequent cultivation will level off the ground sufficiently. Cuttings should not be completely covered, for these plants do not have the power of pushing up through the soil. The best plan is to have them covered one-half to two-thirds of their length. When set at an angle in this way it is thought that they make even better plants than when set upright. One of the difficulties experienced with this crop is due to the brittle nature of the stems and the lack of strength in the root system. A plant weighing 150 to 200 pounds will topple over in wet soil unless well anchored. A cutting set at an angle, as described, becomes much more stable than a cutting set upright. Besides, the cuttings are much more easily set that way. Experience indicates that cuttings should not be set deeply in the ground.

There is much yet to be determined regarding the proper distances to plant. The first plantings made by the Department of Agriculture

were 3 feet apart in 6-foot rows, and this distance has been maintained at the Plant-Introduction Garden at Chico, Cal. (fig. 4). This is a fairly convenient and satisfactory plan for that locality. In situations where the plants grow more vigorously, and consequently require more room, 8-foot rows would be more advantageous.

Contrary to general belief, the cuttings need no treatment preparatory to planting. Ordinarily a cutting will consist of a single joint severed at the constriction as closely as possible. This can be done with a sharp spade or ordinary hoe straightened out so that the blade is in line with the handle. A whole plant can be chopped up in this way and the cuttings distributed in the furrow, as already described, and covered immediately, if the weather conditions are suitable. The



FIG. 4.—A view of the plats of prickly pears shown in figure 3, before harvesting.

plants should never be handled in cold, wet weather and should never be planted in poorly drained soil. They can be handled with safety, with no drying or any other preparation of the cutting, at any season from the time they begin to grow in the spring until it gets too cold in the fall. It is sometimes difficult to secure a good rooting of cuttings during the hot weather in the middle of the summer.

As with any other crop, it is of the utmost importance to secure a perfect stand and as perfect plants as possible. In all plantations missing plants should be replaced by new cuttings and injured or fallen plants reset every spring at least, and oftener if possible. When an area has been once established it is an easy matter to keep up the stand, for all that is necessary is to insert a cutting from some adjoining plant at any time during the warmer half of the year.

CULTIVATION.

The cultivation of prickly pears does not differ materially from that of any other intertilled crop. In brief, it may be said that the ground should be thoroughly prepared and that the subsequent cultivation should be thorough enough and frequent enough to maintain a good tilth and keep down weeds.

At Chico, Cal., where the greater part of the stock of the Department of Agriculture has been grown, there is usually no rain from April to October. It has been the practice to clear out all weeds and put the ground in thorough cultivation immediately after the plants have been cut back for stock to distribute for propagation. This usually consists of plowing with a small moldboard plow. The trampling in this plantation incident to getting out stock is very considerable and compels the use of the plow.

Hoeing out in the rows has also been done at this time. The cultivator is then the important tool. The plowed middles are fined with a shovel-tooth or spike-tooth cultivator. Placing the plantation in good condition in April saves much labor later on. All that is necessary the remainder of the summer is an occasional cultivation with a spike-tooth or a shovel-tooth cultivator. In other regions, such as extreme southern Texas, where rains occur at irregular intervals, the same practice should govern as with cotton or corn.

The plants are shallow rooted. The best cultivation, therefore, will not be deep. Like other plants, the prickly pears adapt themselves readily and the roots can be made to grow deeper, but after the first preparation of the ground the cultivation should be shallow. When plowing is practiced, and it undoubtedly will be found profitable, it should be done at the initial preparation in the spring.

TIME OF HARVESTING.

While the spineless prickly pears, like the spiny native ones, can be used continuously as roughage it is likely that they will be more extensively employed during the drier portions of the year, when succulent feed is scarce. It can be said that, as a general thing, in regions where they are well adapted to grow they can be harvested at any time of the year. There are certain conditions which will modify this statement somewhat.

Cattle do not like the young joints for some time after they first form. Up to the time when they swell out and become in appearance more like mature joints they do not appear to be palatable. Considerable waste in feeding young joints occurs, and economy would suggest that it might be well not to harvest and feed until later in the season.

In regions where the winters are cold and wet, as in the Sacramento Valley for instance, it has been very well demonstrated that it is not safe to handle the plants during this period. Cutting the plants at this time almost invariably causes the greater part of the stems to rot instead of to heal over, as during the warmer season. At Chico no injury has resulted where harvesting has been done after the first of April. A great deal of rotting has resulted, however, when the harvesting has been done in November, indicating that the latter date is not safe. The extent of the rotting will depend in the largest measure on the temperature and moisture conditions immediately following such harvesting.

No experience has been had in southern Texas with spineless forms, but the probability is, judging from the behavior of native plantings of spiny forms, that a week of cold, wet weather following the harvesting will induce some rotting in the stems. It will, however, never be serious, as in the Sacramento Valley.

Attention is called to this matter here and in this definite way as a warning against the unnecessary cutting of these plants during unfavorable weather in the winter. This does not mean that they can not be fed at this time, for it is easy to cut enough of this stock to last nearly a month in winter without any material deterioration. In climates like that of the Sacramento Valley, however, it may not be safe to handle the plants between December and the middle of March.

STABILITY OF THE SPINELESS CHARACTER.

Much anxiety has been expressed by persons receiving plants from the Department of Agriculture as well as from nurserymen as to the stability of their spineless character. The impression appears to be rather widely held that the spineless forms under certain conditions of neglect and general lack of attention will revert to the native spiny form. Nothing could be farther from the truth, for the spineless prickly pears are distinct species or at least reasonably stable varieties which can be propagated indefinitely, especially from cuttings. They will no more revert to some other type when neglected than will corn or wheat, but, like them, will in a short time disappear entirely.

It is well to bear in mind that there are no "spineless" prickly pears that are absolutely spineless. They all have a greater or smaller number of the small spicules and nearly all of them some few spines as well.

It should also be borne in mind that the new growth on cuttings received from the Department of Agriculture or from nurseries is more likely to be spiny than the cuttings when planted. This is due not to any attempt at deception, but to the fact that in packing and

transporting some of the spines and spicules get knocked off unintentionally. Frequently young growth has a few spines which drop off later. Plants sold by nurserymen are only comparatively spineless, for there are none perfectly so. These may, and usually do, under cultivation produce a few spines of no particular consequence. They will no more become too spiny for cattle to eat than will the potato develop the poisonous principles so common to its family.

While the foregoing positive statements are made, it is recognized that there may be great variations due both to reversion and habitat. It is not uncommon to find spineless and spiny joints on the same plant, and environment sometimes has a very decided influence, especially upon the development of the spicules.

Experience with this class of plants under field conditions in this country is too limited to warrant any very great generalization. It may be said that certain unfavorable conditions produce an excess of spines, and more especially of spicules. Drought, excessive heat, and the dwarfing influence of the immediate coast appear to be factors which cause an increase in the armature of these plants. In other words, dwarfing for any cause will often increase the spicules, making them much longer and—apparently, at least—more numerous and consequently more conspicuous. On the other hand, plants which grow normally and rapidly under conditions of care and attention have spicules much less noticeable and less difficult to handle. It is improbable that any of the spineless forms if completely neglected would succeed under conditions prevailing in this country. Attention is called here to the fact that some of the spiny native forms when brought into cultivation under conditions favorable to rapid growth become more spiny than in their native state.

TRANSPORTATION OF PRICKLY PEARS.

Few plants are more easily handled than prickly pears. Ordinarily no special precautions are necessary in shipping cuttings even for long distances in this country. Stock when distributed by mail is usually wrapped in newspaper and then in wrapping paper, and securely tied and labeled. Occasionally cuttings become bruised when handled in this way, but the loss has been small.

On account of the bulky character of the material the greater part of it has been distributed by freight. In such cases the cuttings in good condition are packed as tightly as possible in wooden boxes. Seldom has any paper been used. The loss is usually very small, except when long delays occur in warm weather.

When cuttings are to be shipped for great distances and are likely to be in transit for 6 to 10 weeks, as some of ours have been, it is customary to give them special treatment. In such cases it has been

found necessary to root the stock before shipping it. In warm weather the cuttings will root well in 4 to 6 weeks. They can then be lifted, cleaned, and the roots and young growth trimmed off. In this condition, when properly packed to prevent bruising, it is not at all impossible to transport them in good condition for 6 to 10 weeks. It has been found that a good packing for long transportation consists in wrapping each cutting separately in newspaper, then tying it in corrugated paper. This package is then wrapped and tied in wrapping paper. Cuttings in such packages crowded tightly into wooden boxes have been carried in good condition from the United States to India.

Old cuttings are much firmer than are those of one year's growth. They are harder and much less likely to be bruised. However, they grow just as readily. For long-distance shipments, therefore, old joints are preferred. Probably those 2 to 4 years old would be most suitable.

HOW TO OBTAIN THORNLESS PRICKLY PEARS.

On account of the bulky and heavy nature of the material it is impracticable to transport prickly pears in large quantities. Where the cuttings are placed 3 feet apart in 6-foot rows, it will take nearly 2 tons of stock to plant an acre. The exact quantity will vary with the nature of the cuttings and will have an immediate relation to the conditions under which they are grown. If they are large and old the stock will be all the more valuable, but it will take a greater weight of them. The expense, risk, and difficulty of transporting such quantities are considerable. For this reason it will be best for the grower to obtain a moderate quantity to start with and establish a nursery for growing his own stock.

Under fairly good conditions one cutting will yield an average of 8 to 12 in a season. At this rate 100 will be sufficient to stock a quarter of an acre the second year.

The Department of Agriculture has collected and imported some 25 or more varieties and has distributed 8 or 10 of them in large quantities. All applicants located in situations where it is possible to grow them have received stock.

At the present time about 50 nurserymen located in regions where the prickly pear will flourish have received a stock of these plants. They are propagating these, and in many cases other material received from different sources, for sale. These nurserymen, together with two thousand or more farmers and others who were supplied with cuttings, and occasional small quantities that may be had from public parks where desirable forms have been grown for years, constitute the present sources of supply. Having introduced the stock and distributed it so widely that it can be considered well established, the Department of Agriculture, after the spring of 1912, will make

no distributions except of such new accessions as may come to hand and such other forms as may not be in the trade, but will devote its energies to other phases of the investigations.

FRUIT AND FORAGE VARIETIES OF PRICKLY PEARS.

In much of the recent popular literature on the spineless prickly pear a sharp distinction is drawn between the varieties which bear edible fruit and those which are suitable for forage. There is, in the opinion of the writer, no justification for such a distinction at the present time. The phraseology is misleading and likely to induce the investor to purchase two things instead of one.

There are forms, of course, which produce more desirable fruit than others, but all the forms of spineless pears which are large and rapid enough in growth to be considered for forage produce edible fruits of good quality. One species of the botanical genus *Nopalea*, the cochineal pear, might be regarded as an exception. Its fruits are of no value. Neither is it to be considered seriously for forage in any portion of the mainland of the United States, although it is rather rapid of growth. The time may come when strains of prickly pears may be brought to superior fruitage, but this has not yet been accomplished and is not likely to be for many years, if, indeed, the fruit and forage qualities are likely to be dissociated at all. It is not clear how this can be done, except by development of strains which are more prolific than others, and even then these strains will be just as good for forage, unless the tonnage production is materially reduced. At present those forms are the most desirable for forage which produce the greatest tonnage of plant body. The same varieties produce the larger quantity of the most valuable fruit.

BOTANICAL STATUS OF THORNLESS PRICKLY PEARS.

During the last 150 years names have been given to a number of species of nearly spineless prickly pears. Among them are those known to the botanist as *Opuntia ficus-indica*, *Opuntia crassa*, forms of *Opuntia robusta*, *Opuntia decumana*, *Opuntia elongata*, *Opuntia fusicaulis*, and others. Information regarding the whole genus, however, and more especially the spineless group, is in such confusion that the species can not be satisfactorily segregated until a great deal more careful study has been devoted to it. The last monograph issued admitted but two species to the group, but there are several more described as being spineless. The facts are that the spineless prickly pears scarcely constitute a separate group. When genetic relationships are considered, the majority of them should doubtless be distributed among the spiny species, to which they are most closely related and from which they possibly originated.